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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10/567,134      | 02/06/2006  | Masahiko Igarashi    | 025416-00026        | 4553             |

4372 7590 12/28/2009  
ARENT FOX LLP  
1050 CONNECTICUT AVENUE, N.W.  
SUITE 400  
WASHINGTON, DC 20036

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| EXAMINER |
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GARCIA, ERNESTO

|          |              |
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| ART UNIT | PAPER NUMBER |
|----------|--------------|

3679

|                   |               |
|-------------------|---------------|
| NOTIFICATION DATE | DELIVERY MODE |
|-------------------|---------------|

12/28/2009

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

DCIPDocket@arentfox.com  
IPMatters@arentfox.com  
Patent\_Mail@arentfox.com

|                              |                                      |  |  |
|------------------------------|--------------------------------------|--|--|
| <b>Office Action Summary</b> | <b>Application No.</b><br>10/567,134 | <b>Applicant(s)</b><br>IGARASHI ET AL. |  |
|                              | <b>Examiner</b><br>ERNESTO GARCIA    | <b>Art Unit</b><br>3679                |  |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 21 August 2009.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,4-6,15 and 16 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,4-6,15 and 16 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 August 2009 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>8/28/09</u> .   | 6) <input type="checkbox"/> Other: _____                          |

### **DETAILED ACTION**

The indicated allowability of claim 1 is withdrawn in view of careful study of Beigang, 6,142,033, as the teeth are free to move due to a space between the teeth and another space between the ring 3 and annular groove 6 on the shaft. Rejections based on Beigang follow.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

### ***Drawings***

The drawings were received on August 21, 2009. These drawings are accepted.

### ***Claim Rejections - 35 USC § 112***

Claims 1, 4-6, 15, and 16 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 1, the recitations “a shaft tooth section” in line 5 and “a hub tooth section” in line 6 make unclear whether there are actual teeth in the hub and the shaft thus allow the hub and the shaft to be engaged with each other as required in line 8. Note that pluralities of teeth are required for there to be engagement between the shaft and the hub otherwise there would be structural features lacking that are essential for proper engagement.

Regarding claims 4-6, 15, and 16, the claims depend from claim 1 and therefore are likewise rejected as being indefinite.

***Claim Rejections - 35 USC § 103***

Claims 1, 4-6, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beigang, US 6,142,033, in view of Jacques, FR-2,562,969.

Regarding claim 1, as best understood, Beigang discloses, in Figure 1, a power transmission mechanism comprising a shaft **1** and a hub **2**. A shaft tooth section is formed on the shaft and includes teeth. A hub tooth section is formed on the hub **2** and includes teeth. The hub **2** is disposed around the shaft **1** while holding the shaft tooth section and the hub tooth section in engagement with each other. The shaft tooth section has a crowned peak **Dw** having a tooth thickness along an axial length of the crowned peak and a shaft tooth valley. The hub tooth section has a peak **Dn1** and a hub tooth valley **dn**. The peak **Dn1** of the hub tooth section opposes and engages the shaft tooth valley **dw1**, **dw2** of the shaft tooth section. The peak **Dn1** of the hub tooth section has a constant tooth thickness along an axial length. The hub tooth valley **dn** has a constant inside diameter in an axial direction of the shaft **1**. The shaft tooth valley **dw1**, **dw2** includes first and second portions having different outside diameters and connected by a first step region A1 (see marked-up attachment) sloping from a first starting point at an end of the first portion to an end of the second portion in a direction extending toward the hub tooth section. The peak of the hub tooth section includes first

and second peak portions having different inside diameters and connected by a second step region **A2** sloping from a second starting point at an end of the first peak portion to an end of the second peak portion in a direction extending away from the shaft tooth section.

However, Beigang fails to disclose the crowned peak of the shaft tooth section having a varying tooth thickness, and the first starting point of the first step region and the second starting point of the second step region being offset from each other in the axial direction of the shaft by a predetermined distance.

Jacques teaches, in Figure 5, a crowned peak of a shaft tooth section having a varying tooth thickness to have teeth engage at the widest part of the teeth in a circumferential direction with teeth on a hub thus reducing stress as compared with full engagement with straight teeth. Therefore, as taught by Jacques, it would have been obvious to one of ordinary skill in the art at the time the invention was made to make the crowned peak of the shaft tooth section with varying tooth thickness to have teeth engage at the widest part of the teeth in the circumferential direction with the teeth on the hub to reduce stress.

Further, given that the teeth on the shaft and the hub are free to move relative to each other, the first step region and the second step region could be offset from each other in the axial direction since a gap **A3** is present between the two step regions and another gap **A4** allows a ring **3** to move freely with the hub, the shaft, or vice versa. These gaps **A3**, **A4** allows the hub to shift and thus making the step regions offset from each other. Therefore, it would have been obvious to one of ordinary skill in the art at

the time the invention was made to have the first step region be offset relative to the second step region in the axial direction due to these gaps being present.

Regarding claim 4, Beigang discloses that the first step region of the shaft tooth section has a tilt angle set to a value ranging from 5 degrees to 45 degrees.

Regarding claim 5, Beigang discloses that the varying tooth thickness of the crowned peak of the shaft tooth section comprises a maximum tooth thickness at a crowning top and progressively decreases in the axial direction from the crowning top toward opposite ends of the crowned peak of the shaft tooth section.

Regarding claim 6, Beigang discloses that the shaft tooth section and the hub tooth section are meshing with each other in an area proximate to the crowning top of the crowned peak. The area would have been displaced in a direction from the crowning top of the crowned peak of the shaft tooth section toward the shaft shank as a magnitude of an applied load increases on the crowned peak.

Regarding claim 15, Beigang discloses that the crowned peak of the shaft tooth section has an outside diameter which varies in the axial direction of the shaft (note that the end portion varies).

Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Beigang, US 6,142,033, in view of Jacques, FR-2,562,969, as applied to claims 1, 4-6, and 15, and further in view of Dana, GB-855,282.

Regarding claim 16, Beigang, as modified, fails to disclose the crowned peak of the shaft tooth section having an outside diameter which gradually decreases toward the shaft shank.

Dana teaches, in Figure 3, a crowned peak of a shaft tooth section having an outside diameter which gradually decreases toward a shaft shank 34 (at 35) to reduce engagement between teeth of a hub and teeth on the shaft thus reducing stress at the end portions of the teeth of the shaft. Therefore, as taught by Dana, it would have been obvious to one of ordinary skill in the art at the time the invention was made to make the crowned peak of the shaft tooth section having an outside diameter which gradually decreases toward the shaft shank to reduce stress at the reduce diameter between the teeth of the hub and the shaft.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ernesto Garcia whose telephone number is 571-272-7083. The examiner can normally be reached from 9:30AM-6:00PM. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Daniel P. Stodola can be reached at 571-272-7087.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/E. G./  
Examiner, Art Unit 3679  
December 24, 2009

/Michael P. Ferguson/  
Primary Examiner, Art Unit 3679

Attachment: one marked-up page of Beigang, 6,142,033



